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I. Solution by the PROPOSER.

Tangent $= y\sqrt{1+(dx/dy)^2} + x\sqrt{1+(dy/dx)^2}$, in which $y = (b/a) \times \sqrt{a^2 - x^2}$ and $dy/dx = -bx/a\sqrt{a^2 - x^2}$.

$$\begin{aligned}\therefore U &= \frac{1}{a} \left[\frac{\sqrt{a^2 - x^2}}{x} + \frac{x}{\sqrt{a^2 - x^2}} \right] \sqrt{a^4 - (a^2 - b^2)x^2} \\ &= a \sqrt{\left(\frac{a^4 - (a^2 - b^2)x^2}{x^2(a^2 - x^2)} \right)} = a \text{ minimum.}\end{aligned}$$

$\therefore x = a^3/(a+b)$; and, consequently, the length of the required tangent becomes as stated in the problem.

II. Solution by G. W. GREENWOOD, M.A., Professor of Mathematics, McKendree College, Lebanon, Ill., and J. SCHEFFER, Hagerstown, Md.

Denote the length of the tangent by l , and its equation by $y = mx + \sqrt{a^2m^2 + b^2}$.

$$\therefore l^2 = \left(1 + \frac{1}{m^2}\right)(a^2m^2 + b^2).$$

$$l^2m^2 = a^2m^4 + b^2 + a^2m^2 + b^2m^2 = (am^2 - b)^2 + m^2(a+b)^2.$$

$$\therefore l^2 = (a+b)^2 + \left(\frac{am^2 - b}{m}\right)^2.$$

Hence the minimum value of l is $a+b$.

Also solved by M. E. Graber, and W. L. Tryon.

197. Proposed by R. D. CARMICHAEL, Hartselle, Ala.

$$\int_0^\infty \frac{\sin mx \cos nx}{x} dx.$$

Solution by G. W. GREENWOOD, M. A., Lebanon, Ill.; M. E. GRABER, Tiffin, Ohio, and the PROPOSER.

The required integral may be written

$$\frac{1}{2} \int_0^\infty \left[\frac{\sin(m+n)x}{x} + \frac{\sin(m-n)x}{x} \right] dx,$$

and it therefore reduces to problem No. 186, [January, 1905, page 22]. If $m+n$ and $m-n$ are both positive, the result is $\frac{1}{2}\pi$. If both negative, $-\frac{1}{2}\pi$. If of opposite sign, 0.

Also solved by S. A. Corey.

189. Proposed by M. E. GRABER, A. M., Heidelberg University, Tiffin, O.

Show that $e \int_1^\infty, e^2 \int_2^\infty, \dots, e^n \int_n^\infty, \dots$ are integers divisible by $(p+1)!$, when the expression under the integral is $x^p [(x-1) \dots (x-n)]^{p+1} e^{-x} dx$.